

UNITED STATES AIR FORCE  
McCHORD AFB, WASHINGTON

SPECIFICATION NO: 7260

FOR

PQWY 97-1006

REPAIR/REPLACE POWER POLES - BASE

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## SECTION 01000

## SPECIAL CONDITIONS

1. SCOPE: The work covered in these specifications consists of furnishing all plant, labor, equipment and materials for the construction work at McChord AFB, Washington. The following items are a brief summary of the project and are provided solely for the purpose of revealing the general nature of the work involved. The Contractor is responsible for accomplishing all items of work in accordance with the applicable drawings, specifications and provisions of the contract. Any sundry labor, materials, equipment, and/or appurtenances not specifically detailed or specified, but required to complete the project, shall be provided as an integral part of scope of work hereinafter specified.

1.1 Remove and replace poles noted on construction documents.

1.2 Remove and re-install all pole mounted transformers and wiring on replacement poles.

1.3 Install new pole mounted equipment, grounding and guying on replacement poles as shown.

1.4 Provide equipment grounding connections from pole mounted equipment to grounding electrode system(s) in accordance with drawings and specifications.

1.5 Test grounding systems at each replaced pole to verify ground resistance.

2. APPLICABLE PUBLICATIONS: Federal, commercial and trade association publications, as listed in the separate technical provisions, form a part of this specification to the extent applicable to the work being specified. Such publications are initially listed by basic designation, current issue suffix and subject matter title but will be referred to thereafter in the technical provision by basic designation only.

3. HOURS OF WORK: Unless otherwise approved by the Contracting Officer, all work shall be accomplished between the hours of 7:30 a.m. to 4:30 p.m. daily except weekends and federal legal holidays.

4. CONTRACT DATA: The work site will be in use during the on-site work period. A maximum of one eight hour secondary service power outage for all the work on each transformer pole is allowed. Primary power shall remain energized at all times where feasible. Poles not having switches or transformers shall be replaced without an outage. On pole replacements where maintaining primary power is not feasible, a maximum 4 hour primary outage will be allowed. Primary and secondary power outages shall be scheduled a minimum of 14 calendar days in advance and approved by the Contracting Officer's representative.

4.1 PHASING: All work shall be performed on one feeder distribution line before starting work on another feeder. There are four feeders involved in the project.

5. FIRE PROTECTION: The Contractor shall perform all work in a fire safe manner in accordance with 24 Mar 1993 edition of 62 AWR 92-2, FIRE PREVENTION STANDARDS DURING CONTRACT PERFORMANCE AND CIVIL ENGINEERING IN-HOUSE WORK ACCOMPLISHMENT, available from the Base Civil Engineers. In addition, work shall be performed in accordance with NFPA 241, Safeguarding Building Construction and Demolition Operations, including Appendix A. Special attention shall be provided for welding, cutting or open flame operations in accordance with AFOSH 91-5, and 29 CFR 1910-252.

6. MATERIAL SUBMITTALS: The Contractor shall submit samples, brochures, shop drawings, and/or certificates of materials to the Contracting Officer for approval prior to their installation. If the material submittals show variations from the contract requirements, the Contractor shall describe such variations in writing at the time of submission. Failure to provide such notification will not relieve the Contractor from his responsibility of meeting the contract specifications regardless of whether or not the submittal is approved by the Government. Material submittals shall be as specified under each section. Submittals shall be in quadruplicate unless otherwise indicated.

7. WASTE DISPOSAL: All spoil, waste and debris removed from the work site and not specified for reuse or identified as salvageable items, shall become the responsibility of the Contractor and shall be disposed of off base in areas authorized by the applicable county and/or state agencies and in accordance with current rules and regulations governing the disposal of solid waste. Disposal fees and sundry charges shall be paid by the Contractor.

8. CLEAN-UP AND RESTORATION: The Contractor shall be responsible for all cleanup and restoration of any place affected by his operation. The Contractor shall work continuously and diligently on one particular area or place until all work is completed. The Contractor shall cleanup and restore areas immediately after work is completed. Areas where work is not completed shall be cleaned up and made safe and secure at the end of the work day. Cleanup, restoration, safety and security shall conform to all federal, state and local codes. If any conflicts arise between referenced material, the most stringent requirements shall govern. Determination of clean, restored, safe and secure areas shall be at the sole discretion of the Contracting officer or his approved representative.

9. DIGGING PERMITS: Prior to any excavation, the Contractor shall obtain an approved digging permit (AF Form 103) from the Construction Contract Inspectors (CCI). Contractor shall notify the CCI five (5) days prior to the start of any excavation.

10. SAFETY: All work shall be accomplished in accordance with OSHA 29 CFR 1910, OSHA 29 CFR 1926 and applicable AFOSH Standards.

11. OZONE-DEPLETING SUBSTANCES: The use of ozone-depleting substances will not be utilized during the completion of this project in accordance with Section 326 of the National Defense Authorization Act for Fiscal Year 1993 (Public Law 102-484).

12. PRESENCE OF ASBESTOS: This project has been checked for asbestos and has been found to have none.

13. WORK LAYOUT: The Contractor shall layout the work to insure that the project will proceed in an orderly manner.

14. TOILET FACILITIES: The Contractor shall supply and maintain chemical toilets at the work site.

15. ELEVATED WORK AREAS: Workers in elevated work areas in excess of 6 feet above an adjoining surface require special safety attention. In addition to the provisions of EM 385-1-1, the following safety measures are required to be submitted to the Contracting Officer's Representative. Prior to commencement of work in elevated work areas, the Contractor shall submit drawings depicting all provisions of his positive protection system including, but not limited to, all details of guardrails. Positive protection for workmen engaged in the installation of structural steel and steel joist shall be provided by safety nets, tie-offs, hydraulic man lifts, scaffolds, or other required means. Decking crews must be tied-off or work over nets or platforms not over 6 feet below the work area. Walking on beams and/or girders and the climbing of columns is prohibited without positive protection. Perimeter guardrails shall be installed at floor, roof, or wall openings more than 6 feet above an adjoining surface and on roof perimeters. Rails shall be designed to protect all phases of elevated work including, but not limited to, roofing operations and installation of gutters and flashing. Rails around roofs may not be removed until all work on the roof is complete and all traffic on or across the roof ceases. Rails shall be designed by a licensed engineer to provide adequate stability under any anticipated impact loading. As a minimum, the rails shall consist of a top rail at a height of 42 inches, a mid-rail, and a toe board.

\*\*\*END OF SECTION\*\*\*

SECTION 02050

DEMOLITION

PART 1- GENERAL

1. GENERAL REQUIREMENTS: The work includes demolition, salvage of identified items and materials, and removal of resulting rubbish and debris. Rubbish and debris shall be removed from Government property daily, unless otherwise directed, to avoid accumulation at the demolition site. Materials that cannot be removed daily shall be stored in areas specified by the Contracting Officer. In the interest of conservation, salvage shall be pursued to the maximum extent possible; salvaged items and materials shall be disposed of as specified.

2. SUBMITTALS: The following shall be submitted in accordance with Section 01000, SPECIAL CONDITIONS:

2.1 Work Plan: Submit in writing the following items: The procedures proposed for the accomplishment of the work. The procedures for safe conduct of the work, careful removal and disposition of materials specified to be salvaged, protection of property which is to remain undisturbed, coordination with other work in progress, and timely disconnection of utility services. The procedures shall include a detailed description of the methods and equipment to be used for each operation, and the sequence of operations.

3. PROTECTION:

3.1 Protection of Existing Property: Before beginning any demolition work, the Contractor shall carefully survey the site and examine the drawings and specifications to determine the extent of the work. The Contractor shall take all necessary precautions to avoid damage to existing items to remain in place, to be reused, or to remain the property of the Government, and any damaged items shall be repaired or replaced as approved by the Contracting Officer at no additional cost to the Government. The Contractor shall carefully coordinate the work of this section with all other work and shall construct and maintain shoring, bracing and supports, as required. The Contractor shall ensure that structural elements are not overloaded and shall be responsible for increasing structural supports or adding new supports as may be required as a result of any cutting, removal, or demolition work performed under this contract.

4. BURNING: The use of burning at the project site for the disposal of refuse and debris will not be permitted.

5. USE OF EXPLOSIVES: Use of explosives will not be permitted.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

6. DISPOSITION OF MATERIAL: Title to materials and equipment to be demolished, excepting Government salvage and historical items, is vested in the Contractor upon receipt of notice to proceed. The Government will not be

responsible for the condition, loss or damage to such property after notice to proceed.

6.1 Salvageable Items and Materials: Contractor shall salvage items and materials to the maximum extent possible. Removed wood power poles will not be salvaged and shall become the property of the contractor and shall be disposed of off Government property according to all applicable Government regulations.

6.1.1 Material Salvaged for the Contractor: Material salvaged for the Contractor shall be stored as approved by the Contracting Officer and shall be removed from Government property before completion of the contract. Material salvaged for the Contractor shall not be sold on the site.

6.1.2 Items Salvaged for the Government: Salvaged items to remain the property of the Government shall be removed in a manner to prevent damage and packed or crated to protect the items from damage while in storage or during shipment. Items damaged during removal or storage shall be repaired or replaced to match existing items. Containers shall be properly identified as to contents. The following items reserved as property of the Government shall be delivered to the areas designated as directed by the Contracting Officer.

6.2 Unsalvageable Materials: Concrete, masonry and other non combustible materials, except concrete permitted to remain in place, shall be disposed of in the disposal area location as directed by the Contracting Officer. Combustible materials shall be disposed of in the sanitary fill area located off the site.

7. CLEAN-UP: Debris and rubbish shall be removed from site. Debris shall be removed and transported in a manner that prevents spillage on streets or adjacent areas. Local regulations regarding hauling and disposal shall apply.

8. REMOVAL/ DISPOSAL OF OLD POLES: Old poles shall be removed from McChord Air Force Base. The maximum number of saw cuts which will be allowed per pole is four. Treated poles to be removed shall be appropriately analyzed, accumulated, transported, and disposed of in accordance with WAC173-303-071(3)(g). Any poles that designate as hazardous waste will be managed and disposed of accordingly; and will be transported via a uniform hazardous waste manifest certified by an authorized CES/CEV representative to a permitted Treatment, Storage and Disposal (TSD) facility."

\*\*\*END OF SECTION\*\*\*

## SECTION 16370

## ELECTRICAL DISTRIBUTION SYSTEM, AERIAL

## PART 1 - GENERAL

1. REFERENCES: The references listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

## 1.1 AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI C2	(2001, Rev.2002) National Electrical Safety Code
ANSI C29.1	(1988, Rev.1996) Electrical Power Insulators - Test Methods
ANSI C29.2	(1992, Rev.1999) Insulators - Wet-Process Porcelain and Toughened glass - Suspension Type
ANSI C29.3	(1986, Rev.1995) Wet Process Porcelain Insulators - Spool Type
ANSI C29.4	(1989, Rev.1995) Wet Process Porcelain Insulators - Strain Type
ANSI C29.5	(1984, Rev.1995) Wet Process Porcelain Insulators - Low- and Medium-Voltage Pin Types
ANSI C29.6	(1996) Wet Process Porcelain Insulators - High-Voltage Pin Type
ANSI C29.7	(1996; C29.7a) Wet Process Porcelain Insulators - High-Voltage Line-Post Type
ANSI C29.8	(1985, Rev.1995) Wet Process Porcelain Insulators - Apparatus, Cap and Pin Type
ANSI C29.9	(1983, Rev. 1996) Wet Process Porcelain Insulators - Apparatus, Post-Type
ANSI C37.32	(1996) Switchgear High Voltage Air Switches
ANSI C135.1	(1979) Galvanized Steel bolts and Nuts for Overhead Line Construction
ANSI 135.2	(1987) Threaded Galvanized Ferrous Strand-Eye Anchor Rods and Nuts for Overhead Line Construction
ANSI 135.4	(1987) Zinc-Coated Ferrous Eyebolts and Nuts for Overhead Line Construction

- |             |  |
|-------------|--|
| ANSI 135.14 | (1979) Staples with Rolled or Slash Points for Overhead Line Construction                              |
| ANSI 135.17 | (1988) Galvanized Ferrous Bolt-Type Insulator Pins with Lead Threads for Overhead Line Construction    |
| ANSI 135.22 | (1988) Galvanized Ferrous Pole-Top Insulator Pins with Lead Threads for Overhead Line Construction     |
| ANSI 135.30 | (1988) Zinc-Coated Ferrous Ground Rods for Overhead Line Construction or Underground Line Construction |
| ANSI 135.33 | (1988) Galvanized Ferrous Crossarm Gains Threads for Overhead Line Construction                        |
| ANSI O5.1   | (1987) Specifications and Dimensions for Wood Poles  |
- 1.2 AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)
- |             |  |
|-------------|--|
| ASTM A 123  | (1997) Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products                           |
| ASTM A 153  | (1995) Zinc Coatings (Hot-Dip) on Iron and Steel Hardware                                      |
| ASTM A 475  | (1998) Zinc-Coated Steel Wire Strand   |
| ASTM A 575  | (1996) Steel Bars, Carbon, Merchant Quality, M-Grades  |
| ASTM A 576  | (1990b) Steel Bars, Carbon, Hot-Wrought, Special Quality                                       |
| ASTM B 1    | (2001) Hard-Drawn Copper Wire  |
| ASTM B 8    | (1999) Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft                   |
| ASTM B 117  | (1997) Salt Spray (Fog) Testing  |
| ASTM D 1654 | (1992; Rev. 2000) Evaluation of Painted or Coated Specimens Subjected to Corrosive Environment |
- 1.3 AMERICAN WOOD-PRESERVERS' ASSOCIATION (AWPA)
- |         |   |
|---------|---|
| AWPA C4 | (1995) Poles - Preservative Treatment by Pressure Processes |
|---------|---|



- |             |  |
|-------------|--|
| AWPA C25    | (2001) Sawn Crossarms - Preservative Treatment by Pressure Processes             |
| AWPA P1/P13 | (1995) Coal Tar Creosote for Land and Fresh Water and Marine (Coastal Water) Use |
| AWPA P5     | (2001) Waterborne Preservatives  |
| AWPA P8     | (2001) Oil-borne Preservatives   |
| AWPA P9     | (2001) Solvents and Formulations for Organic Preservative Systems                |
- 1.4 INSTITUTE OF ELECTRICAL AND ELECTRONIC ENGINEERS (IEEE)
- |                |  |
|----------------|--|
| IEEE C57.19.00 | (1991, Rev. 97) General Requirements and Test Procedure for Outdoor Power Apparatus Bushings Characteristics and Dimensions for Outdoor Apparatus Bushings |
| IEEE C57.19.01 | (1991, Rev. 97) Standard Performance Characteristics and Dimensions for Outdoor Apparatus Bushings   |
| IEEE Std 81    | (1983) Guide for Measuring Earth Resistivity, Ground Impedance, and earth Surface Potentials of a Ground System  |
| IEEE Std 100   | (1988; 4th Ed) IEEE Standard Dictionary of Electrical and Electronic Terms   |
- 1.5 NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)
- |           |  |
|-----------|--|
| NEMA HV 2 | (1984, Rev. 96) Application Guide for Ceramic Suspension Insulator |
|-----------|--|
- 1.6 NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)
- |         |                                 |
|---------|---------------------------------|
| NFPA 70 | (2002) National Electrical Code |
|---------|---------------------------------|
- 1.7 RURAL ELECTRIFICATION ADMINISTRATION (REA)
- |           |   |
|-----------|---|
| REA DT-5B | (Jun 1987) Wood Crossarms (Solid and Laminated), Transmission Timbers and Pole Keys |
|-----------|---|
- 1.8 UNDERWRITERS LABORATORIES (UL)
- |         |  |
|---------|--|
| UL 467  | (1993; Rev thru Nov 1986) Grounding and Bonding Equipment                |
| UL 486A | (1997) Wire Connectors and Soldering Lugs for Use with Copper Conductors |

UL 486B

(1997) Wire Connectors for Use with Aluminum  
Conductors

## 2. GENERAL REQUIREMENTS

2.1 Terminology: Terminology used in this specification is defined in IEEE Std 100.

3. SUBMITTALS: The following shall be submitted in accordance with Section 01000 SPECIAL CONDITIONS:

3.1 Manufacturer's Catalogs; Submit catalog information on the following material items:

- a. Wood Poles
- b. Wood Crossarms
- c. Insulators
- d. Copper Conductors
- e. Secondary Cables
- f. Combination Cutout/Arresters
- g. Ground Rods
- h. Downguy materials
- i. Group Operated Air Switch

If departures from the contract drawings are deemed necessary by the Contractor, complete details of such departures shall be submitted with the detail drawings. Approved departures shall be made at no additional cost to the Government.

3.2 Materials and Equipment; Where materials or equipment are specified to conform to the standards of the Underwriters Laboratories (UL) or to be constructed or tested, or both, in accordance with the standards of the American National Standards Institute (ANSI), the Institute of Electrical and Electronic Engineers (IEEE), or the National Electrical Manufacturers Association (NEMA), the Contractor shall submit proof that the items provided under this section of the specifications conform to such requirements. The label of, or listing by, UL will be acceptable as evidence that the items conform thereto. Either a certification or a published catalog specification data statement, to the effect that the item is in accordance with the referenced ANSI or IEEE standard, will be acceptable as evidence that the item conforms thereto. A similar certification or published catalog specification data statement to the effect that the item is in accordance with the referenced NEMA standard, by a company listed as a member company of NEMA, will be acceptable as evidence that the item conforms thereto. In lieu of such certification or published data, the Contractor may submit a certificate from a recognized testing agency equipped and competent to perform such service,

stating that the items have been tested and that they conform to the requirements listed, including methods of testing of the specified agencies. Compliance with above-named requirements does not relieve the Contractor from compliance with any other requirements of the specifications.

4. DELIVERY, STORAGE, AND HANDLING: Devices and equipment shall be visually inspected by the Contractor when received and prior to acceptance from conveyance. Stored items shall be protected from the environment in accordance with manufacturer's published instructions. Damaged items shall be replaced. Wood poles held in storage for more than two weeks shall be stored in accordance with ANSI O5.1. Handling of wood poles shall be in accordance with ANSI O5.1, except that pointed tools capable of producing indentations more than inch in depth shall not be used.

## PART 2 - PRODUCTS

5. MATERIALS AND EQUIPMENT: Products shall conform to the following requirements. Items of the same classification shall be identical including equipment, assemblies, parts, and components.

5.1 STANDARD PRODUCTS: Material and equipment shall be the standard product of a manufacturer regularly engaged in the manufacture of the product.

### 5.2 CORROSION PROTECTION

5.2.1 Aluminum shall not be used in contact with earth or concrete. Where aluminum conductors are connected to dissimilar metal, fittings conforming to UL 486B shall be used.

#### 5.2.2 Ferrous Metal Materials

5.2.2.1 Hardware: Ferrous metal hardware shall be hot-dip galvanized in accordance with ASTM A 123 and ASTM A 153.

5.2.2.2 Equipment: Equipment and component items shall be provided with corrosion-resistant finishes which shall withstand 120 hours of exposure to the salt spray test specified in ASTM B 117 without loss of paint or release of adhesion of the paint primer coat to the metal surface in excess of 1/16 inch from the test mark. The described test mark and test evaluation shall be in accordance with ASTM D 1654 with a rating of not less than 7 in accordance with TABLE 1, (procedure A). Cut edges or otherwise damaged surfaces of hot-dip galvanized sheet steel or mill galvanized sheet steel shall be coated with a zinc rich paint conforming to the manufacturer's standard.

### 5.3 CONDUCTORS, CONNECTORS, AND SPLICES

5.3.1 Copper Conductors: Hard-drawn copper conductors shall comply with ASTM B 1 and ASTM B 8 as appropriate for the conductor size.

5.3.2 Connectors and Splices: Connectors and splices shall be of copper alloys for copper conductors, aluminum alloys for aluminum composition conductors, and a type designed to minimize galvanic corrosion for copper to

aluminum-composition conductors. Aluminum composition and aluminum composition to copper shall comply with UL 486B, and copper to copper shall comply with UL 486A.

5.4 POLES AND HARDWARE: Joint use electrical/roadway-lighting poles shall be wood poles utilizing crossarm construction. A vertical pole space noted on details shall be reserved at all locations. Poles shall be of lengths and classes indicated.

5.4.1 Wood Poles: Wood poles shall comply with ANSI O5.1, and shall be full-length pressure treated in accordance with AWPA C4, with creosote conforming to AWPA P1/13 or with oil-borne preservatives and petroleum conforming to AWPA P8 and AWPA P9, respectively, and waterborne preservatives conforming to AWPA P5. Waterborne preservatives shall be either chromated or ammoniacal copper arsenate. Any species listed in ANSI O5.1 for which a preservative treatment is not specified AWPA C4, shall not be used; northern white cedar, if treated as specified for western red cedar, and western fir, may be used. Wood poles shall have pole markings located approximately 10 feet from pole butts for poles 50 feet or less in length, and 14 feet from pole butts for poles longer than 55 feet in length. Poles shall be machine trimmed by turning smooth full length, and shall be roofed, gained, and bored prior to pressure treatment. Where poles are not provided with factory-cut gains, metal gain plates shall be provided.

5.4.2 Pole Line Hardware: Zinc-coated hardware shall comply with ANSI C135.1, ANSI C135.2, ANSI C135.4, ANSI C135.14, ANSI C135.17, ANSI C135.22, and ANSI C135.33. Steel hardware shall comply with ASTM A 575 and ASTM A 576. All hardware shall be hot-dip galvanized in accordance with ASTM A 153. Pole line hardware shall be hot-dip galvanized steel. Suitable washers shall be installed under bolt heads and nuts on wood surfaces and elsewhere as required. Washers used on through bolts and double arming bolts shall be approximately 2-1/2 inches square and 3/16-inch thick. The diameter of holes in washers shall be the correct standard size for the bolt on which a washer is used. Washers for use under heads of carriage-bolts shall be of the proper size to fit over square shanks of bolts. Eye bolts, bolt eyes, eyenuts, strain-load plates, lag screws, guy clamps, fasteners, hooks, shims, and clevises shall be used wherever required to support and to protect poles, brackets, crossarms, guy wires, and insulators.

5.4.3 Guy Assemblies: Guy assemblies shall be aluminum-clad steel in accordance with ASTM B 416 or zinc-coated steel in accordance with ASTM A 475. Guy assemblies, including insulators and attachments, shall provide a strength exceeding the required guy strength. Three-eye thimbles shall be provided on all anchor rods to permit attachment of individual primary, secondary, and communication down guys. Anchors shall provide adequate strength to support all loads. Guy strand shall be 7 strand. Guy material shall be zinc-coated-steel high strength grade or aluminum-clad-steel-strand, with a minimum breaking strength not less than 6000 pounds, except where two or more guys are used to provide the required strength. Guy rods shall be not less than 8 feet in length by 3/4 inch in diameter.

5.5 INSULATORS: Insulators shall comply with NEMA HV 2 for general requirements. Suspension insulators shall be used at corners, angles, dead-ends, other areas where line insulators do not provide adequate strength,

and as indicated. Mechanical strength of suspension insulators and hardware shall exceed the rated breaking strength of the attached conductors.

5.5.1 Medium-Voltage Line Insulators: Medium-voltage line insulators shall comply with ANSI C29.2, ANSI C29.5, ANSI C29.6, and ANSI C29.7 as applicable. Ratings shall not be lower than the ANSI classes indicated in TABLE I. Horizontal line post insulators shall be used for armless construction and shall have the same mechanical and electrical ratings as vertical line post insulators for the ANSI class indicated, but shall be modified to be suitable for horizontal installation. Where line post insulators are used for angles greater than 15 degrees, clamp top fittings shall be provided as well as for other locations shown. Conductor clamps for use with clamp-top, line-post insulators shall be hot dip galvanized malleable iron for copper conductors and aluminum alloy or aluminum-composition conductors. Either line-post or pin insulators may be used for crossarm construction. Pin insulators for use on voltages in excess of 6 kV phase-to-phase shall be radio-interference-freed or else line-post insulators shall be used.

TABLE I. MINIMUM ANSI RATING OF MEDIUM-VOLTAGE INSULATORS BY CLASS

<u>Voltage Level</u>	<u>Line-Post</u>	<u>Pin</u>	<u>Suspension</u>
Up to 5 kV	57-1 or 11	55-3	One 52-1
	57-1 or 11	55-5	Two 52-1
6 kV to 15 kV	57-1 or 11	55-5	Two 52-2
	57-2 or 12	56-3	Two 52-3 or 4

5.5.2 Low Voltage Line Insulators: Low-voltage line insulators shall comply with ANSI C29.2 and ANSI C29.3 as applicable. Spool insulators for use on low-voltage lines shall be mounted on clevis attachments and shall be not smaller than Class 53-2. For No. 4/0 AWG and larger conductors, Class 53-4 shall be used. Suspension insulators on clevis attachments used at dead-ends shall be not smaller than Class 52-1.

5.5.3 Strain Insulators for Guy Wires: Strain insulators for use in insulated guy assemblies shall comply with ANSI C29.4 for porcelain or equivalent fiberglass, and shall have a mechanical strength exceeding the rated breaking strength of the attached guy wire. Insulators shall be not smaller than Class 54-3 for lines of 6 kV to 15 kV.

5.5.4 Apparatus Insulators: Apparatus insulators shall comply with IEEE C57.19.00, IEEE C57.19.01, ANSI C29.8, and ANSI C29.9 as applicable.

## 5.6 CROSSARM ASSEMBLIES

5.6.1 Crossarms: Crossarms shall comply with REA DT-5b and be solid wood, distribution type, except cross-sectional area with pressure treatment conforming to AWPAC25, and a 1/4-inch, 45 degree chamfer on all top edges. Cross-sectional area minimum dimensions shall be 4-1/4 inch's in height by 3-1/4 inch's in depth in accordance with ANSI C2 for Grade B construction. Crossarms shall be 8 feet in length, except that 10-foot crossarms shall be used for crossarm-mounted banked single-phase transformers or elsewhere as

indicated. Crossarms shall be machined, chamfered, trimmed, and bored for stud and bolt holes before pressure treatment. Factory drilling shall be provided for pole and brace mounting, for four pin or four vertical line-post insulators, and for four suspension insulators, except where otherwise indicated or required. Drilling shall provide required climbing space and wire clearances. Crossarms shall be straight and free of twists to within 1/10-inch per foot of length. Bend or twist shall be in one direction only.

5.6.2 Crossarm Gains: Crossarm gains shall comply with ANSI C135.33.

#### 5.7 GROUNDING AND BONDING

5.7.1 Ground rods shall be of copper-clad steel conforming to UL 467 not less than 5/8-inch in diameter by 8 feet in length.

5.7.2 Grounding Conductors: Grounding conductors shall be bare, except where installed in conduit with associated phase conductors. Insulated conductors shall be of the same material as the phase conductors and green color-coded, except that conductors shall be rated no more than 600 volts. Bare conductors shall be ASTM B 8 soft-drawn unless otherwise indicated. Aluminum is not acceptable.

5.8 Combination Cutout/Arresters: shall be factory assembled into a combined unit with crossarm mounting bracket and hardware. Arrester portion shall be 12KV rated and shall be of the gapless, metal-oxide-varistor distribution-class type. Cutouts shall be heavy duty open drop out type, rated at 15KV, 100A (min).

5.9 Hot Line Clamps: shall be bronze body type suitable for installation on energized primary line conductors with the use of a hot stick.

5.10 Stirrups (Bail Clamps): shall be factory manufactured type with crimped connections to primary lines and shall be constructed of materials suitable for the main line and jumper conductor materials.

5.11 Pole-Top Group Operated Air Break Switch shall be horizontal blade type complete with metal pole mounting crossarm and operating mechanism with handle located at 5 feet above ground. Unit shall meet the requirements of ANSI C37.32 and shall have the following ratings and features:

Current Rating	600 amps, three phase
Voltage Rating	15kv
Bil Rating	110kv
Momentary Rating	40,000 amps

#### PART 3 - EXECUTION

6. GENERAL INSTALLATION REQUIREMENTS: Equipment and devices shall be re-installed and energized in accordance with accepted practices.

6.1 Conformance to Codes: The installations shall comply with the requirements and recommendations of NFPA 10 and ANSI C2 for medium loading districts, Grade B construction. No reduction in clearance shall be made.

6.2 Verification of Dimensions: The Contractor shall become familiar with details of the work, shall verify dimensions in the field, and shall notify the Contracting Officer of any discrepancy before performing any work.

6.3 Tree Trimming: Where lines pass through trees, trees shall be trimmed at least 8 feet clear on both sides horizontally and below for medium-voltage lines, and 4 feet clear on both sides horizontally and below for other lines, and no branch shall overhang horizontal clearances.

## 7. POLE INSTALLATION

7.1 Wood Pole Setting: Wood poles shall be set straight and firm. Pole setting depths shall be as shown. In rocky or swampy ground, pole-setting depths shall be decreased or increased as shown. In swampy or soft ground, a bog shoe shall be used where support for a pole is required. Poles in straight runs shall be in a straight line. Curved poles shall be placed with curvatures in the direction of the pole line. Poles shall be set to maintain as even a grade as practical. When the average ground run is level, consecutive poles shall not vary more than 5 feet in height. When the ground is uneven, poles differing in length shall be kept to a minimum by locating poles at points other than the highest and lowest ground points. If it becomes necessary to shorten a pole, a piece shall be sawed off the top end and roofed. If any pole is shortened after treatment, the shortened end of the pole shall be given an application of hot preservative. Where poles are set on hilly terrain, along edges of cuts or embankments, or where soil may be washed out, special precautions shall be taken to ensure durable pole foundations, and the setting depth shall be measured from the lower side of the terrain. Holes shall be dug large enough to permit proper use of tampers to the full depth of a hole. Earth shall be placed into a hole in 6-inch maximum layers, then thoroughly tamped before the next layer is placed. Surplus earth shall be placed around a pole in a conical shape and packed tightly to drain water away from poles.

7.2 Pole Locations: the locations of the new poles shall be coordinated with and approved by the Contracting Officer's Representative and in no case shall be more than 3 feet from the existing pole location.

7.3 CATV and telephone reattachments. The contractor is responsible to coordinate with the servicing cable company and the McChord Base Communications Office to reattach their equipment and wiring to the new poles and to pay any associated costs."

## 8. CROSSARM MOUNTING

8.1 Crossarms shall be bolted to poles with 5/8-inch through-bolts with square washers at each end. Bolts shall extend not less than 1/8-inch nor more than 2 inches beyond nuts. On single crossarm construction, the bolt head shall be installed on the crossarm side of the pole. Metal crossarm braces shall be provided on crossarms. Flat braces may be provided for 8-foot crossarms and shall be 1/4-inch by 1-1/4 inches, not less than 28 inches in length. Flat braces shall be bolted to arms with 3/8-inch carriage bolts with

round or square washers between bolt heads and crossarms, and secured to poles with 1/2-inch by 4-inch lag screws after crossarms are leveled and aligned. Angle braces are required for 10-foot crossarms and shall be 60 inch span by 18 inch drop formed in one piece from 1-1/2 inch by 1-1/2 inch by 3/16-inch angle. Angle braces shall be bolted to crossarms with 1/2-inch bolts with round or square washers between bolt heads and crossarms, and secured to poles with 5/8-inch through-bolts. Double crossarms shall be securely held in position by means of 5/8-inch double-arming bolts. Each double-arming bolt shall be equipped with four nuts and four square washers.

8.2 Line Arms and Buck Arms: Line arms and buck arms shall be set at right angles to lines for straight runs and for angles 45 degrees and greater; and line arms shall bisect angle of turns of less than 45 degrees. Dead-end assemblies shall be used for turns where existing. Buckarms shall be installed, where existing, at corners and junction poles. Double crossarms shall be provided where existing on a pole to be replaced.

8.3 Equipment Arms: Equipment arms shall be set parallel or at right angles to lines as required to provide climbing space. Equipment arms shall be located below line construction to provide necessary wire and equipment clearances. Equipment arms shall be provided where existing on a pole to be replaced.

9. GUY INSTALLATION: Guys shall be replaced in kind at poles to be replaced. Eliminate guys wrapped around poles. Guy clamps 6 inches in length with three 5/8-inch bolts, or offset-type guy clamps, or approved guy grips shall be provided at each guy terminal. Guy-strain insulators shall be provided in each guy for replaced wood poles. A half-round yellow polyvinyl, fiberglass, or other suitable plastic guy marker, not less than eight feet in length, shall be provided at the anchor end of each guy replaced, securely clamped to the guy or anchor at the bottom and top of the marker. Holding capacities for down guys shall be based on a lead angle of 45 degrees.

## 10. CONDUCTOR INSTALLATION

10.1 Line Conductors: Unless otherwise indicated, conductors shall be re-installed maintaining existing sags and tensions. Proper care shall be taken in handling conductors to avoid abrasions, sharp bends, cuts, kinks, or any possibility of damage to insulation or conductors. Bend radius for any insulated conductor shall be at no time less than the applicable NEMA specification recommendation. Sag and tension shall be checked by the Contractor in accordance with approved sag and tension charts.

10.2 Connectors and Splices: Connectors and splices shall be mechanically and electrically secure under tension and shall be of the non bolted compression type. The tensile strength of any splice shall be not less than the rated breaking strength of the conductor. Splice materials, sleeves, fittings, and connectors shall be non corrosive and shall not adversely affect conductors. Aluminum-composition conductors shall be wire brushed and an oxide inhibitor applied before making a compression connection. Connectors that are factory-filled with an inhibitor are acceptable. Inhibitors and compression tools shall be of types recommended by the connector manufacturer. Primary line apparatus taps shall be by means of hot line clamps attached to compression type bail clamps (stirrups) which are existing at poles to be



replaced. Low-voltage connectors for copper conductors shall be of the solderless pressure type. Non insulated connectors shall be smoothly taped to provide a waterproof insulation equivalent to the original insulation, when installed on insulated conductors. On overhead connections of aluminum and copper, the aluminum shall be installed above the copper.

10.3 Conductor-To-Insulator Attachments: Conductors shall be properly attached to insulators. For insulators requiring conductor tie-wire attachments, tie-wire sizes shall be as indicated in TABLE II.

TABLE II. TIE-WIRE REQUIREMENTS

CONDUCTOR TIE-WIRE	
<u>Copper (AWG)</u>	<u>Soft-Drawn Copper (AWG)</u>
6 8	
4 and 2 6	
1 through 3/0	4
4/0 and larger	2
<u>AAC, AAAC, or ACSR (AWG)</u>	<u>AAC or AAAC (AWG)</u>
Any Size	6 or 4

10.4 Armor Rods: Armor rods, where existing, shall be replaced. Lengths and methods of fastening armor rods shall be in accordance with the manufacturer's recommendations. For span lengths of less than 200 feet, flat aluminum armor rods may be used. Flat armor rods, not less than 0.03 by 0.25 inch shall be used on No. 1 AWG AAC and AAAC and smaller conductors and on No. 5 AWG ACSR and smaller conductors. On larger sizes, flat armor rods shall be not less than 0.05 by 0.30 inches. For span lengths of 200 feet or more, preformed round armor rods shall be used.

10.5 Medium-voltage Cables: Existing medium-voltage cable messengers, if not already, shall be attached to poles with clamps providing a strength exceeding the messenger strength and with not less than 5/8-inch through-bolts.

10.6 Low-Voltage Cables: Low-voltage cables where on secondary racks shall be supported on clevis fittings using spool insulators on new poles. Clevis attachments shall be provided with not less than 5/8-inch through-bolts.

11. TRANSFORMER INSTALLATION: Existing pole mount transformers shall be removed and remounted so as not to scratch finishes or damage bushings. Transformers shall be reinstalled similar to original installation, except where new mounting brackets are indicated. After installation and prior to re-energization, bushings and surfaces shall be inspected for damage and scratches touched up.

12. CONNECTIONS BETWEEN AERIAL AND UNDERGROUND SYSTEMS: Connections between aerial and underground systems shall be maintained. Underground cable/conduit extensions up poles shall be reattached to new poles. Conduits shall be secured to the wood poles by two-hole galvanized steel pipe straps spaced not

more than 10 feet apart and with one strap not more than 12 inches from any bend or termination. Cables shall be supported by devices separate from the conduit or guard, near their point of exit from the riser conduit AC guard. Cable guards shall be secured in accordance with the manufacturers published procedure.

13. CONNECTIONS TO BUILDING: Connections to buildings are existing and do not require work except as required to replace the pole at the service take-off point. Maintain all existing connections to buildings.

14. GROUNDING: Non current-carrying metal parts of equipment and conductor assemblies, such as luminaires, medium-voltage, cable termination's and messengers, metal poles, operating mechanisms of pole top switches, panel enclosures, transformers, capacitors, recloser frames (cases) and other noncurrent-carrying metal items shall be grounded. Additional grounding of equipment, neutral, and surge arrester grounding systems shall be installed at replacement pole installations.

14.1 Grounding Electrodes: Grounding electrodes as required shall be installed as follows:

a. Driven rod electrodes - Unless otherwise indicated, ground rods shall be located approximately three feet out from base of the pole and shall be driven into the earth until the tops of the rods are approximately one foot below finished grade. Multiple rods shall be evenly spaced at least 10 feet apart and connected together two feet below grade with minimum No. 6 AWG bare copper conductor.

b. Pole butt electrodes - Pole butt electrodes shall be installed where on existing poles, except that this method shall not be the sole grounding electrode at transformer locations. The pole butt electrode shall consist of a coil of at least 12 feet of minimum No. 6 AWG bare copper conductor stapled to the butt of the pole.

c. Plate electrodes - Plate electrodes shall be installed in accordance with the manufacturer's instructions and ANSI C2 and NFPA 70.

d. Additional electrodes - Whenever the required ground resistance is not met, provide additional electrodes interconnected with grounding conductors, to achieve the specified ground resistance. The additional electrodes will be up to three, 10-foot rods spaced a minimum of ten feet apart or a single extension-type rod, 5/8-inch diameter, up to 30 feet long, driven perpendicular to grade.

14.2 Grounding and Bonding connections: Connections above grade shall be made by the fusion-welding process or with bolted solderless connectors in compliance with UL 476, and those below grade shall be made by a fusion-welding process. Where grounding conductors are connected to aluminum-composition conductors, specially treated or lined copper-to-aluminum connectors suitable for this purpose shall be used.

14.3 Grounding Electrode Conductors: A single continuous vertical grounding electrode conductor is and shall be installed on each pole and connected directly to existing and/or added grounding electrodes. All

equipment, neutrals and other items required to be grounded shall be connected directly to this vertical conductor. The grounding electrode conductor shall be sized to match existing pole grounding electrode conductor. Secondary system neutral conductors shall be connected directly to the transformer neutral bushing, then connected with a neutral bonding jumper between the transformer neutral bushing and the vertical grounding electrode conductor, as shown. Grounding electrode conductors shall be stapled to wood poles at intervals not exceeding 2 feet. Bends greater than 45 degrees in grounding electrode conductor are not permitted.

14.4 Surge Arrester Grounding: A separate #6 AWG solid copper grounding conductor shall be connected to the surge arresters, run down the pole on the opposite side from the pole ground to a separate ground rod.

## 15. FIELD TESTING

15.1 General: Field testing shall not be required except for unusual conditions occurring during replacement of a pole and its associated appurtenances. Contracting Officer shall be provided with a daily log of poles replaced. If the Contractor encounters an installation condition or situation that results in a requirement to use or install material not covered by contract shall notify the Contracting Officer immediately. The Contractor shall furnish all materials, labor, and equipment necessary to conduct field tests. The Contractor shall perform all tests and inspections required to ascertain proper installation or safety unless specifically waived by the Contracting Officer. The Contractor shall maintain a written record of all tests that includes date, test performed, personnel involved, devices tested, serial number as applicable and name of test equipment, and test results. Contractor shall sign and date all field reports.

15.2 Safety: The Contractor shall provide and use safety devices such as rubber gloves, protective barriers, and danger signs to protect and warn personnel in the test vicinity. The Contractor shall replace any devices or equipment that are damaged due to improper test procedures or handling.

15.3 Ground-Resistance Tests: The resistance of each grounding electrode system shall be measured using the fall-of-potential method defined in IEEE Std 81. Results shall be presented on a graph of test electrode distances versus resistance with a minimum of 5 points on the graph. Ground resistance measurements shall be made before final grounding connections are made and shall be made in normally dry conditions not less than 48 hours after the last rainfall. Test shall be done to verify ground resistance has not changed during replacing the pole. Resistance measurements of separate ground electrode systems shall be made before the systems are bonded together below grade.

15.4 Pre-Energization Services: The following services shall be performed subsequent to testing but prior to the initial energization. The equipment shall be inspected to insure that installation is in compliance with normal installation practice. Termination of conductors at major equipment shall be inspected to ensure the adequacy of connections. Bare and insulated conductors between such terminations shall be inspected to detect possible damage during re-installation. Components shall be inspected for damage caused during removal and re-installation. Components capable of being manually and/or

electrically operated shall be manually operated to verify correct installation. Any components that are out of adjustment shall be adjusted per manufacturer's recommendations or if installed incorrectly, re-installed correctly. Items for which such services shall be provided, include but are not limited to, the following:

Automatic circuit recloser

Capacitors

Switches

Transformers

16. ACCEPTANCE: Final acceptance will not be given until the Contractor has successfully completed all tests and after all defects in installation, material or operation have been corrected.

\*\*\*END OF SECTION\*\*\*